

Appendix 2: Parts Information

The part values chosen for the experiments in this book are based on the power output capability of the three-phase sources used and that the parts don't get too hot to touch.

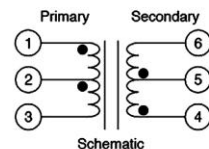
The *Phase Tripler* outputs up to 125mW per phase which is about 30mA RMS per phase at 12V p-p (4.24V RMS). Minimum load impedances are given for an output of 12V p-p, phase to neutral, in the table below.

Connection	Load	V p-p	V rms	I rms/Phase	P/Phase
Line to Neutral	142	12V	4.24V	30mA	125mW
Line to Line	432	20.8V	7.35V	17mA	125mW

Transformers

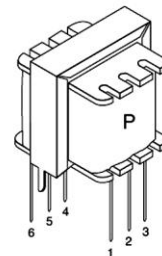
Mouser Stock No.	Impedance		Resistance	
	Primary	Secondary	Primary	Secondary
42TU500-RC	500Ω	500Ω	35Ω	28Ω

- Core type / size: EI-24
- Impedance variation: $\pm 10\%$ @ 1KHz
- D.C. resistance: $\pm 15\%$
- Max. output: 460mW
- Frequency response: $\pm 3\text{dB}$, 300-3.4KHz @ 1KHz 0dB



Mouser Stock No.	Impedance (Ω)		Resistance (Ω)		Turns
	Pri.	Sec.	Pri.	Sec.	Pri.:Sec.
42TM016-RC	600	600	65	55	1:1

- Core type/size: EI-19
- Impedance variation: $\pm 10\%$ @ 1KHz
- DC resistance tolerance: $\pm 15\%$
- Frequency response: $\pm 3\text{dB}$, 300Hz~3.4KHz @ 1KHz 0dB
- Maximum output: 200mW



The recommended transformers below are compact and have wire leads which can be directly plugged into a breadboard. They both work well at 400Hz. The 42TU500-RC may be used at 60Hz but with lower efficiency.

Inductors

The magnitude of an inductor's impedance is given by: $|Z_L| = \sqrt{R_w^2 + X_L^2}$.

For convenience, the magnitude of the impedance at 60Hz and 400Hz of a selection of inductors is given in the table below. These are manufactured by Fastron: www.fastrongroup.com.

These inductors are available from Mouser Electronics at a unit price of \$1.38 per unit (January 2014 price).

No	Mouser Part Number	L mH	R _w Ω	60Hz X _L	60Hz Z _L	400Hz X _L	400Hz Z _L
1	434-02-223J	22	20	8.3	21.7	55.3	58.8
2	434-02-333J	33	26	12.4	28.8	82.9	86.9
3	434-02-563J	56	58	21.1	61.7	140.7	152.2
4	434-02-683J	68	66	25.6	70.8	170.9	183.2
5	434-02-823J	82	71	30.9	77.4	206.1	218
6		100	120	37.7	125.8	251.3	278.5

The table below provides the manufacturer data for the inductors above.

No	Part No	Inductance	f _L	Tol	Q	f _Q	DCR	Rated DC
		L (mH)	(MHz)	± (%)	min	(MHz)	max (Ω)	Current (mA)
1	07M-223K-50	22	0.02	10	100	0.079	19.5	21
2	07M-333K-50	33	0.02	10	100	0.079	26.0	17
3	07M-563K-50	56	0.02	10	100	0.079	58.0	12
4	07M-683K-50	68	0.02	10	70	0.079	66.0	12
5	07M-823K-50	82	0.02	10	70	0.079	71.0	10
6	07M-104K-50	100	0.02	10	55	0.030	120	7

Capacitors

A 1μF capacitor has a reactance of 2653Ω at 60Hz and 398Ω at 400Hz. Capacitors in the 1μF to 10μF are needed for practical experiments at 60Hz. These must be non-polarized and preferably have a tolerance of

10% or better. The tolerance is not critical if an accurate capacitance meter is available.

A section of the Mouser on-line catalog (January 2014) below shows a sampling of capacitors available. TDK MLCC Capacitors.

MOUSER STOCK NO.		Value (pF)	Volt. (Vdc)	Tol. (%)	Price Each	
Mfr.	Mfr. Part No.				1	50
810	—FK11X7R2A105K	1 μ F	100	10%	.49	.374
810	—FK11X7R1H225K	2.2 μ F	50	10%	.61	.468
810	—FK11X7R1H335K	3.3 μ F	50	10%	.61	.468
810	—FK11X7R1H475K	4.7 μ F	50	10%	.73	.56
810	—FK11X7R1E685K	6.8 μ F	25	10%	.88	.654
810	—FK11X7R1C106K	10 μ F	16	10%	.62	.457

On-Line Part Sources

All Electronics

Allied Electronics

Digi-Key Electronics

Jameco Electronics

Mouser Electronics

Newark Electronics

Radio Shack